Regional Growing Smarter Implementation Plan and its Influence on Regional Growth

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Abstract: In 1998, "Growing Smarter" legislation was passed by the Arizona Legislature requiring cities and towns to create comprehensive plans for future growth. In response to this legislation, the Maricopa Association of Governments is developing a Regional Growing Smarter Implementation Plan to encourage a consistent regional approach for future growth and to create strategies and a policy framework to direct infrastructure development and open space areas. The end results will help local governments with their own general plan updates and identify necessary regional policies. GIS applications required to test the impact of growth strategies upon congestion and transportation systems, other regional infrastructure needs and costs, schools, and open space will be discussed.

The Maricopa Association of Governments serves as the lead regional planning agency for the metropolitan Phoenix area, which includes 24 cities, two Indian communities and Maricopa County. As the designated Metropolitan Planning Organization (MPO) and Council of Governments (COG) for a region inhabited by over three million people, MAG understands the crucial responsibility inherent in its role of facilitating decisions affecting land use, transportation and air quality.

MAG is one of the few agencies responsible not only for regional transportation planning, but also for land use, air quality, water quality, solid waste and human services planning. In other metropolitan areas these responsibilities are usually handled by two or more separate agencies, making coordination of the planning activities more cumbersome. MAG has been seeking to improve the performance of its regional land use, transportation, and air quality modeling models, thereby making the regional planning process more effective. GIS has played a major role at MAG for the past twelve years in improving these models. This technology has significantly enhanced MAG's ability to manage dozens of planning databases: databases describing census statistics, employment inventories, land use, general plans, parcels, building permits, and highway infrastructure. GIS also helps MAG assume an important responsibility in the region – the role of a regional information agency for public planning.

Growing Smarter

In 1998, "Growing Smarter" legislation was passed by the Arizona Legislature requiring cities and towns to plan for future growth in a way that would enhance the quality of life. In response to this legislation, MAG applied for and received a Transportation and Community and System Preservation (TCSP) grant to develop an implementation plan to encourage a consistent regional approach for future growth and to create strategies and a policy framework to direct infrastructure development and open space areas. By 2003, each of the 25 local jurisdictions in Maricopa County is required to have in place a new general plan developed in conformance with the Growing Smarter legislation. At a minimum, these plans are required to incorporate land use and circulation elements. However, as these are being developed independently, the Maricopa Association of Governments will closely evaluate the complete regional picture.

The implementation plan currently underway by MAG involves: enhancing regional planning efforts by collaborating with local governments on plan updates; gathering the databases necessary to evaluate future development; and using the databases to run regional models and test the impact of locally derived plans upon regional congestion and transportation systems, other regional infrastructure needs and costs, schools, and open space. The end results of the

implementation plan will be two-pronged: first, to help local governments with their own general plan updates, and second, to identify regional problems and issues and to suggest necessary regional policies to address them. MAG will also provide member agencies with "best practices" reports on local planning issues (1) that should be dealt with on a consistent basis by all agencies, or (2) by addressing a local issue that would be better dealt with from a regional perspective.

This paper describes the GIS activities resulting from the TCSP grant awarded to MAG. The grant was intended to create the basis for ongoing and more active regional planning and problem solving. GIS analysis has involved working towards developing methods for (1) understanding the regional socioeconomic impacts of long-term land use plans being generated by the member agencies and (2) better appreciating the environmental consequences of plan implementation.

General Plan Land Use Data

In the past 10 years Maricopa County has grown by almost 1 million people to exceed 3 million residents. MAG's regional composite of local land use plans implies a build-out regional population of 13 million persons – more than 4 times the size of the regional population in 2000. While each of the 27 local jurisdictions within the county have attempted to cope with this growth individually, MAG has been seeking to integrate their efforts into a consistent regional approach through a Smart Growth Implementation Plan. The twenty-four cities and towns and Maricopa County in the MAG region are required to amend their General Plans by December 31, 2002 at the latest, to comply with Growing Smarter legislation. MAG is conducting a review of each of these updated General Plans with the intent to understand the impact of these plans at a regional scale.

The General Plan Land Use identifies both the type of development that is anticipated to occur in the future, and the density of the development. The plan is the vision of the future as seen and developed by the community. Generally, the plan being provided to MAG for analysis is comprised of detailed documentation of the plan along with a hard copy of the plan. A number of the communities now also provide the plan in GIS format. In cases where this electronic version is not made available, MAG needs to convert the paper copy to a GIS theme.

Each General Plan classifies the land use using a scheme unique to the member agency. Each of these land use categories are accompanied with their respective housing or employment densities. Although MAG uses these densities to perform most regional analysis, we also bring all the General Plans onto a common land use scheme. MAG has developed regional standard land use categories, which are utilized to convert the disparate local land use categories to its regional standard. This often involves working with the member agencies to develop an equivalency table for this conversion. Table 1 is an extract of the residential land uses from the conversion table created for one such member agency.

MPA LAND USE DESCRIPTION	MPA LU CODE	MAG LU CODE	MAG LAND USE DESCRIPTION	MIN. DU DENSITY	MAX. DU DENSITY	TARGET. DU DENSITY
0 to 1	10	110	Rural Residential	0.20	1.00	0.50
0 to 2	12	110	Rural Residential	0.20	2.00	1.00
1 to 2	20	120	Estate Residential	1.00	2.00	1.50
2 to 3.5	24	130	Large Lot Residential (SF)	2.00	3.50	2.80
5 to 7	46	140	Medium Lot Residential (SF)	5.00	7.00	6.00
5 to 10	48	140	Medium Lot Residential (SF)	5.00	10.00	8.00
8 to 10	49	140	Medium Lot Residential (SF)	8.00	10.00	9.00
10 to 15	50	150	Small Lot Residential (SF)	10.00	15.00	12.00
15 +	53	160	Very Small Lot Residential (SF)	15.00	20.00	18.00
20 - 30	86	180	High Density Residential (MF)	20.00	30.00	25.00

MPA to MAG land use code mapping table

Many jurisdictions have a "mixed use"/ “multiple use” category in their local land use plan. A “multiple use” category in the existing use primarily signifies areas being developed with different land uses. For example, the same building might have retail and office on the lower levels and high density residential on the upper levels. “Mixed use” category in the General Plan refers to areas that may have a mix of residential and employment uses. Mixed use is not only defined differently between two jurisdictions, it may also be different between two areas within the same agency. Thus, within the Phoenix General Plan, North Phoenix may be envisioned to contain a certain mix of office, light industrial, retail, and residential space, while another mixed-use area in the downtown area may contain only retail and office. Because mixed use may be defined differently depending on the jurisdiction, MAG works with its member agencies on a definition for mixed use that varies by jurisdiction, or even by location within jurisdictions. Also, to better emulate the land use on ground, a new linked data structure has been developed. In this structure, there can be more than one record that describes the contents of a land use polygon, for each polygon. Land use polygons, therefore can contain residential (dwelling units), employment (of various types), and special population group features (motels, mobile homes, etc.). The implication of this data model is simply that there are no constraints – any land use polygon can contain anything or any combination of things. It is totally flexible.

Along with the conversion of the land use categories to the regional standard, the residential densities and floor area ratios for employment are also converted to MAG standards. While MAG's standard land use categories define densities and floor area ratios, the land use categories in the local plans may not always fit into the same categories. Again, MAG must work with the local jurisdictions to ensure that data is consistent across the region. It is important to note, that the data structure used by the socioeconomic model incorporates both the jurisdictional classification as well as the MAG equivalent values.

Socioeconomic Analysis

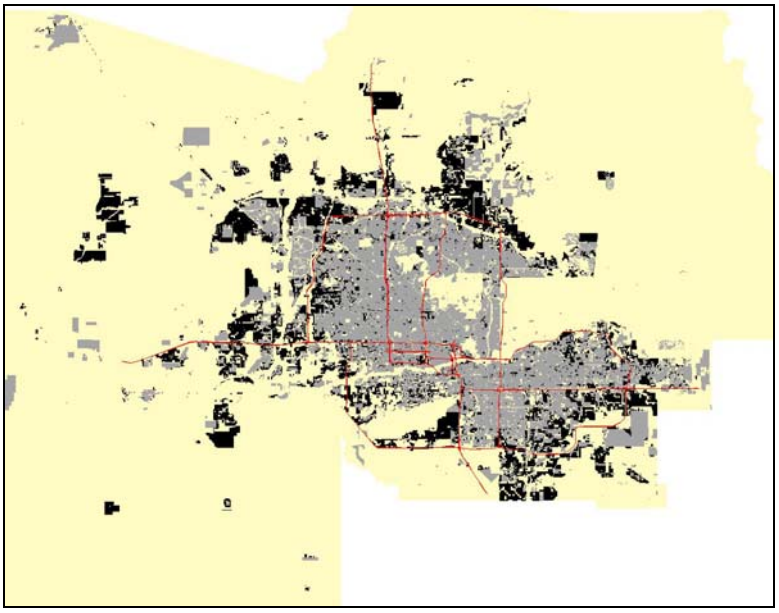
MAG utilizes its Sub Area Allocation Model (SAM) to assess the General Plans from the member agencies. SAM-IM is a rule-based urban growth model. It simulates both short-term and long-term urbanization of a region by reacting to any set of factors and conditions that the planner wishes to express. The model is completely embedded in a GIS – it runs on ArcView GIS using the Spatial Analyst extension. The concept of the model is entirely GIS oriented – all

of the data that drives the model, whether it be existing land use distributions, future market conditions, adopted planned land use, developments already approved and underway, or local land conditions, are expressed geographically, in the form of ArcView shape files. Anything that can be expressed geographically can be taken into consideration in the model.

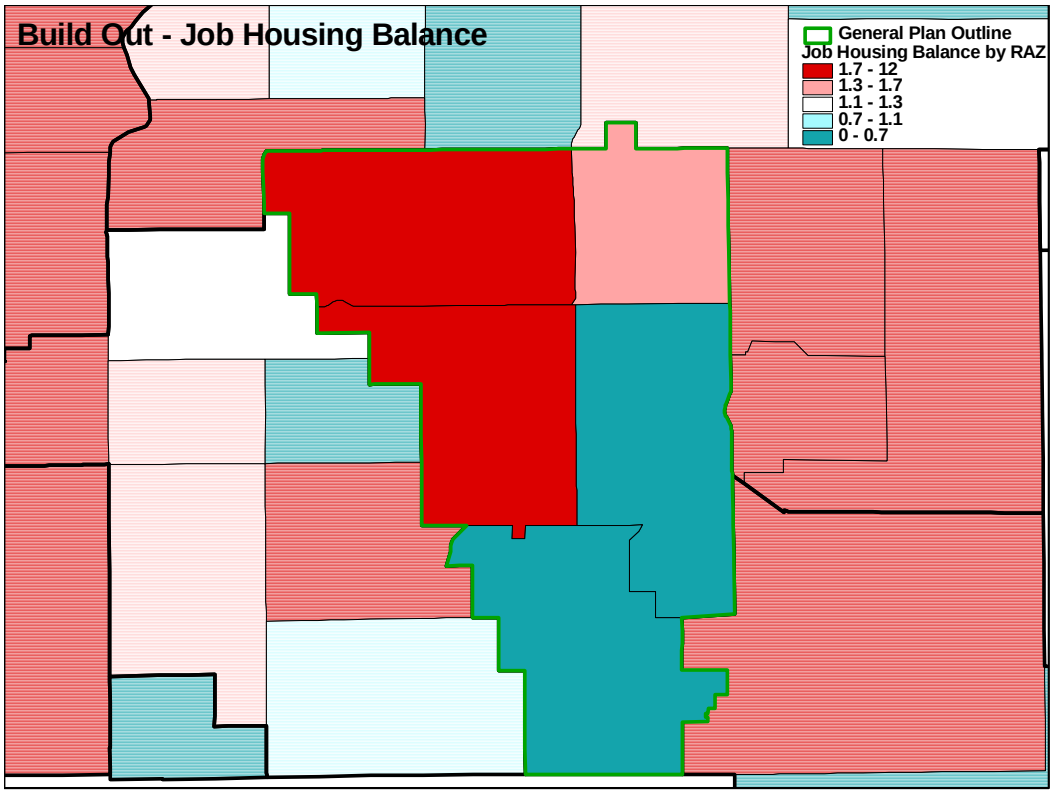
SAM forecasts and analyzes land use and development throughout the MAG planning region. It does this by simulating factors that influence the likelihood that land will be built, based on those factors. It observes planning policies – general plan designations controlling the use of land (approved by municipalities in the region), for example, are observed by the model.

Once the General Plan data issues are resolved, the updated General Plans can then input local land use data into SAM-IM to assess the impact of these local plans on regional issues. Different build out scenarios are created to assess how the local vision of the future would affect the region as a whole. The scenarios include high, medium, and low intensity growth options. Also, complete or selected redevelopment may also be modeled. Comparisons are drawn between the General Plan and the socioeconomic projections in terms of population growth, employment areas and accessibility of employment from residences. The build out generated from the General Plan is also assessed against how well it ties into the complete region. It should be noted that since SAM models growth at a 1-acre grid level, the build out model results can be analyzed at any geography including Census Tracts, Traffic Analysis Zones, Regional Analysis Zones, or other local boundaries that can be translated to a spatial coverage.

Another important factor that is assessed is the ratio of jobs available in an area to the resident households in the area. This job/housing balance within an is one indication of the extent of travel required in an area. It is important in specifying a General Plan to ensure that the residential growth in an area is balanced by appropriate employment and conversely, that employees have appropriate housing options near where they work. This information also becomes a part of the analysis of transportation, school, and water infrastructure requirements in an area.

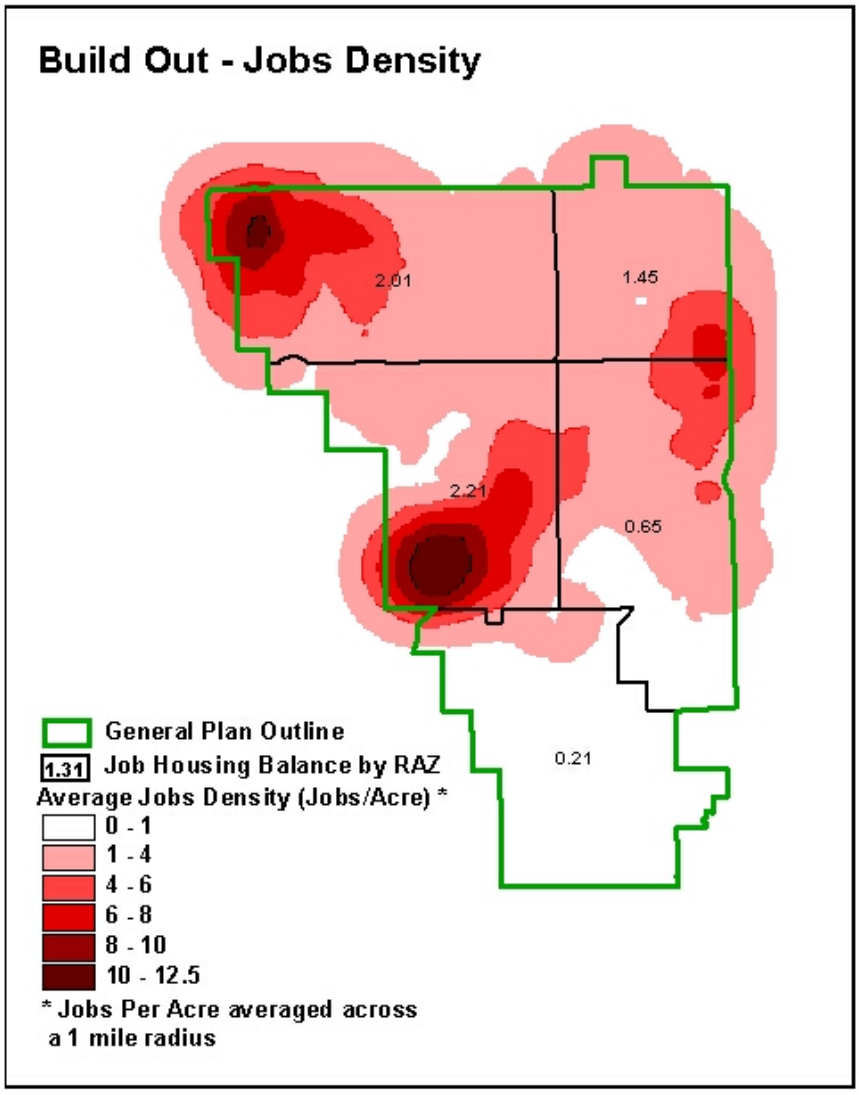


The SAM-IM simulation generated this forecast scenario of growth and development in Maricopa County over the next 20 years. Shown in gray are existing "built" uses (in 1995). Shown in black are new developments projected to occur by the year 2020. (The proposed 2020 freeway system is also shown).



Build out and Job-Housing Balance analysis for the Town of Gilbert General Plan

The average density of jobs planned in an area is also an important indicator for sustainability of the Plan. This analysis is conducted at the Grid level using scripts in SAM. It is possible to calculate the job density for each cell averaged over a specified radius. These maps become part of the General Plan analysis done for the jurisdiction in their review of their General Plan.



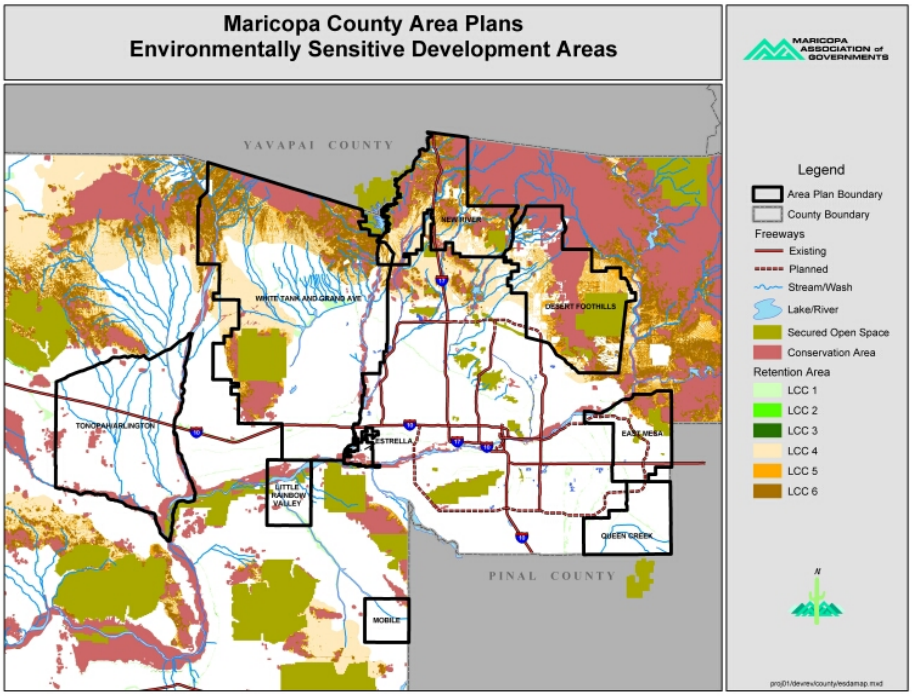
Average Job Density Analysis conducted using SAM for Build out

Environmentally Sensitive Development Areas

The MAG Regional Open Space Plan, Desert Spaces was adopted in 1995. This plan is a guide for MAG member agencies to protect sensitive open spaces while allowing future growth and development. The plan is for an integrated regional open space system. In addition to areas identified for conservation and policies for linkage, one element identifies public and private lands with high open space value, and recommends that sensitive development regulations be used in these areas. In June 2000, MAG also adopted the Environmentally Sensitive Desert Areas Policies and Design Guidelines recommending restrictions on new growth in environmentally sensitive areas.

As part of the Growing Smarter Implementation Plan, MAG is reviewing local land use plans for their impact on open space. In areas where environmentally sensitive development regulations are recommended, there are six development standards that are based on a land cover classification (LCC) system. In the LCC system, there are two vegetation categories: upper Sonoran and lower Sonoran. Within each vegetation category, LCC types are further categorized by slope. LCC types 1, 2, and 3 fall within lower Sonoran vegetation and have slopes of 0-3 percent, 3-6 percent, and greater than 6 percent, respectively. LCC types 4, 5, and 6 fall within upper Sonoran vegetation and are categorized similarly by slope.

MAG obtained elevation lattices for the region from the Arizona State Land Department and developed a GIS data set of the LCC types by deriving slope from these lattices and combining slope and vegetation type with the Desert Spaces Plan data. As local land use plans come in for review, MAG can then overlay GIS coverages of these plans with the LCC type data. Standard map templates have been created that allow MAG GIS staff to easily create context maps that show how these local land use plans relate to regional environmentally sensitive development areas and open space. MAG can also analyze and report the acreage of environmentally sensitive development areas that are within the various land uses designated by the local jurisdiction.



Environmentally sensitive areas analysis for the County. MAG's Desert Spaces Plan, Vegetation data, and slope derived from DEM were used for the analysis.

General Plan Review : Area within Environmentally Sensitive Lands

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Conservation Area:

Category		Acres
Residential		3,150
Commercial/Office		440
Industrial/Commerce Park		790
Public/Quasi-Public		400
Mixed Use		310
Undesignated		420
Parks/Open Space/Water		11,600
TOTAL	**17,110**	

Retention Area (LCC 4):

Category		Acres
Residential		20,620
Commercial/Office		910
Industrial/Commerce Park		1,510
Public/Quasi-Public		850
Mixed Use		2,810
Undesignated		3,860
Parks/Open Space/Water		17,020
TOTAL	**47,580**	

Note: LCC 4 is Retention Areas in Upper Sonoran Vegetation with 0 - 3% slope.

Sample components of analysis report for General Plan ESDA analysis

Future Developments

Research has been done into fully automating this mapping and analysis, however there are issues that have prevented full automation thus far. One such issue is local data format. If MAG does receive local land use plan data in digital form, it may come in formats ranging from ArcInfo export files to ArcView shape files, to CAD files. Once the data is successfully imported into MAG's GIS, the land use type field name is not consistent, and land use types are not consistent from jurisdiction to jurisdiction. Because of these issues, review of local land use plans from a GIS perspective is still largely a time-intensive process. MAG will ensure all data and GIS coverages derived for and from this process will be made available to the member agencies, with the goal of ensuring consistent databases in the future.